B. The LECG Datasets and Empirical Approach

The principal LECG dataset is a collection of Arbitron ratings for 346 stations in 48 cities, for three half-hour time slots, each of the five weekdays, recorded for 14 years (1966-76, 1979, 1987, 1993). In a dataset this large (31,633 records), it is nearly impossible to avoid errors of some kind. However, there are systematic mistakes in this dataset that cannot be overlooked. Perhaps the most serious recording error concerns the identification of the stations themselves. Literally dozens of stations were misclassified. Sometimes the mistake is understandable (e.g., classifying WNAC-64 in Boston when it is located in Providence) and other times it is baffling (e.g., KTVW is channel 33 in Phoenix, not channel 13 in Seattle). There are even Canadian stations in the dataset (e.g., CBET-9 in Windsor, Ontario), which are obviously not subject to FCC regulations like PTAR.

Gaps in the data also present a problem. We will remark below on the sporadic nature of the time series and its econometric consequences. Data are missing for certain years for several stations. Also, for example, a half dozen stations are missing records for the entire access period. The challenge then becomes how to treat the missing data.[36]

Oddly enough, the LECG dataset may suffer from being too large. We found that many of the stations included in its sample failed to meet Nielsen's minimum reporting standards. This shows up in the Arbitron ratings where we find that 14.3% of the time the independent

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[36] Certain key data necessary to replicate LECG's results were either missing or implied. For instance, the number of independents had to be inferred from the number of records for non-affiliates that appeared in the sample for each city-year pair. In addition, whereas LECG reported results for real per capita income, the data was supplied in nominal terms and without any deflator. The Bureau of Economic Analysis's nationwide Consumer Price Index (1982-84 = 100) was then used to deflate the series.

stations in the sample receive a zero rating for the access period.[37] Moreover, 9.73% of independent stations received a zero rating in all five weeknights during the access period. Frequency distributions of ratings reveals a collection of independents clustered at the very bottom of the ratings range, with another collection registering ratings distribution more like network affiliates.

LECG's statistical methods in deriving its results are rather unconventional. Especially noteworthy are its tendencies to:

- select years for the time series that occur sporadically, precluding any possibility that the dynamic structure of these markets could be properly specified;
- truncate the sample of markets arbitrarily, making inferences to smaller markets suspect;[38]
- report point estimates for regression coefficients only if they are statistically significant, making it impossible to confirm LECG's model estimates.

As a consequence of these failings, it is not possible to put any confidence in the predictions of the model for cities outside the top 30, for years beyond 1993, and even for time periods other than 7:30-9:00 PM, Monday-Friday. In particular, LECG never reports confidence intervals for its estimates for the impact of PTAR on independent stations (and necessarily for affiliates

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[37] Compare this with the network affiliates who receive this bottom rating in only 1.76% of the cases. Arbitron follows the same reporting scheme as Nielsen who uses a zero rating to indicate that the station meets some minimum standards necessary to enter the sample, but that its rating falls below 1% of television households. If a station does not meet this criterion, no rating is reported at all.

[38] LECG limits the sample to the top 30 markets in 14 years (1966-76, 1979, 1887, 1993) claiming that "there are relatively few independents outside the top 30 markets" (p.23, Appendix D). In fact, independent stations in the top 50 markets that met Nielsen's minimum reporting standards totaled 128 in 1986 and 149 in 1994. Of these, 31 in 1986 and 38 in 1994 (or 25% of the top 50 total) reside in markets 31-50, markets which LECG neglects.

as well). Whatever the point values for these predictions, the range of statistical possibility in many cases is likely to be so large that the Commission is unable to conclude even the direction of the effects.

C. The Ratings Equation

A central objective of LECG's empirical efforts is to establish the effect of PTAR on the audience ratings of independent stations. LECG specifies a relationship between the average Arbitron rating of an independent station in each of the top 30 markets and in each of the 14 year periods and several explanatory variables, many of which are intended to capture PTAR's effects.

By taking averages of all independent stations in a market, LECG precludes any insight as to why independent stations perform differently. By further removing affiliate stations from the sample, we lose all hope of learning how PTAR affects stations' performance in terms of the crucial distinction made by the Rule.

1. LECG's Estimation of PTAR's Effects on Independent Stations

LECG estimates the ratings relationship controlling for several different features of television markets: the percentage of TV households that subscribe to cable service (%CAB), the number of independent stations in the market (Nind), and a crude measure of consumer purchasing power (PCI$\times$TVHH, the product of per capita income and the number of TV households in a market). All other variables are designed to capture the temporal effect of PTAR: a PTAR "dummy variable" which takes on a value of 1 starting in 1971, and zero otherwise (D_{PTAR}), a linear, quadratic and cubic time trend interacted with the PTAR dummy ($T71$, $T71^2$, $T71^3$), and two of the market variables interacted with the PTAR dummy

($D_{PTAR} \times PCI \times TVHH$, $PTAR \times Nind$).

LECG's principal model relates independent stations' Arbitron ratings to several explanatory variables. It estimates this relationship using a linear regression despite the fact that the dependent variable is confined to the range between 0 and 1. A linear regression is a poor specification because it quickly goes out of the 0-1 range, resulting in biased coefficients, and especially poor predictions when forecasting in the extreme portions of the sample range. Aware of the problem, LECG estimates a logistic regression that remains within range, but does not report the results of that estimation, nor does it use the estimated coefficients from this regression to conduct its forecasting exercise.

The principal conclusions that LECG draws from its estimation results are:

- PTAR increases the average independent station access period rating by 1.52 rating points in every year following its adoption;
- Taking all three half-hour periods together, there is a one-time increase of 3.4 points;
- Greater cable penetration and numbers of independent stations depress ratings.

LECG's specification does a poor job of controlling for economic factors that would explain station performance over time and across markets. First of all, this specification does not introduce any intertemporal dependencies, a serious omission since it is very likely that current station ratings depend heavily on past performance. While this could be captured with lagged variables, the construction and interpretation of these variables is awkward given the sporadic nature of the time series.

Second, cross sectional variation is not likely to be captured by the $PCI \times TVHH$ variable.

This variable would provide a reliable proxy for real income of TV households in a market only if the number of individuals per household does not vary over time and across markets. Also there is no indication that LECG deflated per capita income using regional deflators, despite the fact that the largest 50 metropolitan areas ranged from 47.2% above, to 17.8% below, the national income average.[39, 40]

Finally, in another part of their report, LECG concludes that whether a station broadcasts on the UHF band is an important determinant of its ratings.[41] Nevertheless, this variable is not included in their specification of the ratings relationship. When we introduce a dummy variable for stations that broadcast in the UHF range, we find that it has a significant, negative coefficient. We also never see any account taken of the relative use of off-network vs. syndicated programming, which is a key empirical question facing this preceding.

2. A Re-Examination of LECG's Ratings Equation

To gain a better understanding of what LECG has actually modelled, we estimated the very same ratings equation as reported by LECG, but we did not average the independent stations' ratings within markets. As a result we use observations for each of the 346 stations represented in LECG's database.[42] We then proceed to:

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[39] U.S. Department of Commerce, Statistical Abstract of the United States, 1993.

[40] A more satisfying approach that takes full account of variation across markets is to include a dummy variable for each city. In this way, all market-specific variation is explained without the need for measuring the individual market conditions. Since LECG is not interested here in the coefficients on market specific variables, this alternative specification would serve the purpose of measuring the size of the PTAR effect.

[41] See LECG, Appendix C.

[42] More specifically, a datapoint consists of one of 347 stations (both independent or network affiliate), in one of three half-hour time slots (averaged over the five weekdays) and in one of 14 year periods. In LECG's estimation, stations were grouped by market and then their ratings were averaged;

- estimate both linear and logistic ratings regressions, applying LECG's weighting procedure intended to correct for heteroscedasticity;
- estimate regressions for the access period rating and an average rating for the first two half-hours of prime time;
- estimate the specification for network affiliates as well for independent stations.

We then depart from the LECG specification by introducing several variables, individually and in combination, that are designed to control for economic differences across independent stations. This is possible in our sample because the basic unit of observation is the individual station, not stations averaged by markets.

First we re-estimate the basic LECG specification with the station data.[43] The estimated coefficients are much different from those in the LECG report. The only variables that are statistically significant are the time trends. The PTAR dummy is <u>not</u> statistically significantly different from zero. When we apply this same specification to the prime time half hours, not a single variable in the LECG specification turns up significant.

What this shows is that, by averaging together all independent stations in each market, LECG has suppressed substantial differences across stations. Whereas independent station ratings vary wildly taken individually, a city-wide average has little variation as we look across the country. It is also little wonder why they get such a good "fit" for their model using market-specific variables (PCI, %CABLE, PCI×TVHH, Nind). This model merely picks up differences across markets in terms of how favorable they are to independent broadcasting. It

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those averages were then recorded for each of the three time slots and 14 years.

[43] In all cases we run the Goldfeld-Quandt test for heteroscedasticity which justifies LECG's use of weighted regressions. However, in many cases we find little in the way of an inverse relationship between TVHH and the residuals, suggesting LECG's choice of regression weights may be incorrect.

has little power to explain ratings of different independent stations.

Next, we apply this same basic model to access and prime time periods for the network affiliates. Focusing on the access period, we find only the constant term in the regression is statistically significant: none of the market variables contribute to explaining the variation of station ratings around the sample average, including the PTAR dummy. Turning to the prime time periods, we find that the PTAR dummy now enters significantly with a positive coefficient.[44] This is the reverse of what is one would expect. Clearly, the PTAR dummy is picking up more than just the effect of PTAR. By imposing a regime change for the entire post-1970 period, the PTAR dummy acts as a proxy for many events affecting the performance of all types of television stations.

In our attempt to differentiate among stations, we then introduce several new variables that measure the "age" of a station.[45] Some of these variables simply measure the cumulative number of years a station has been operating at a point in time; others indicate whether a station had begun operation before some specified date, such as 1970. When applied to network affiliates, we find that without exception the various measures of age are not statistically significantly different from zero.[46]

The case of independent stations is completely different. Uniformly, the coefficients on

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[44] The estimated coefficient is 0.0799 which says that PTAR added 8 rating points to affiliates' first hour of prime time every year since 1971. While that more than five times the ratings impact LECG discovered for independent stations, it is understandable because the average affiliate rating in our sample is over three times as large as the average independent (15.432 points vs. 4.852 points).

[45] Dates for first operation were gathered from the Television & Cable Factbook, Vol. II (Television), Warren Publishing, 1995.

[46] What is clear from results for both independents and affiliates is that many of the coefficients in the basic specification undergo dramatic change in size and sign. This instability in the coefficient estimates suggests that this is a poor specification at least for our disaggregated dataset.

the age variables are positive (indicating that established independents get higher ratings) and highly statistically significant. For example, stations that began operating before PTAR was enacted were rewarded on average with 3½ points during the access period, and 2¾ points during the first hour of prime time. In these same estimations we found that the coefficient on the PTAR dummy was not significantly different from zero, meaning that the ratings of independent stations that began operation after PTAR was adopted did not benefit to any significant extent.

The picture that emerges is one in which PTAR has differential effects on independent station. Apparently, PTAR resulted in a windfall gain to established independent stations.[47] It may also have attracted additional independents given the FCC's generous allocation of UHF frequencies. However, these stations did not benefit from the protection afforded by PTAR as measured by audience ratings. This is understandable given the phenomenal growth in the number of independent stations following adoption of PTAR. These UHF frequencies were invariably occupied by independent stations. The rapidly growing ranks of marginal independent stations diluted the ratings of the new entrants.

3. LECG Errs in its Prediction of the Effect of PTAR's Repeal

The main purpose of LECG's rating equation is to predict the effect of repeal of PTAR on the ratings of independent stations for the ten-year period beginning in 1995. To do so, they forecast ratings under two scenarios–with PTAR and without PTAR–and assume that other exogenous variables change according to certain rules.[48] In conducting this exercise, LECG

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[47] By trying different age dummies we notice that the largest ratings impact occurs for stations that began operating before 1965.

[48] PCI×TVHH grows at its 1966-1993 average annual rate, %CAB grows at its 1973-1993 average annual rate, and Nind remains unchanged.

makes several serious errors, any one of which invalidates their conclusions.

First, consider LECG's interpretation of the "PTAR effect." Included are not only the PTAR dummy and its various interactions, but all three time trends: T71, $T71^2$ and $T71^3$. Here the variable T71 is defined as the number of years since 1970 (and zero before that time), and so, for instance, $T71^3 = (25)^3 = 15{,}625$ in 1995. The reasoning given is that PTAR's effect occurs with a time lag. As a result, all variations across time that is not accounted for in the other three exogenous variables is captured in these time trends.[49] Monumental events have impacted the television industry since 1970 and PTAR has not had the greatest effect. During that time:

- Satellite distribution of television signals was perfected and its use spread to the distribution of syndicated programming and the appearance of superstations;
- Cable television not only went from being a rarity to a nearly ubiquitous service offering dozens of cable-exclusive channels;[50]
- Development of more powerful UHF transmitters and click stop channel selectors for the UHF band;[51]
- The video cassette market was born, grew up, and reached maturity;
- Many significant changes in FCC regulation of television broadcasting and cable

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[49] It is possible to incorporate a dummy variable that does not a constant fixed effect over the entire post-1970 period. A simple way to do so would be to specify a gradually "phasing in" of PTAR's effect perhaps by inclusion of the term: $\beta_{PTAR} \times (1 - e^{-\gamma(t - 70)}) \times D_{PTAR}$ where γ is some positive parameter.

[50] Between 1970 and 1991 the average number of channels increased from 4-5 to 35.3 per system; between 1970 and 1993 the number of cable networks increased from 0 to 80; and over that same period the number of cable systems increased from 2,490 to 11,385. National Cable Television Association, "Growth of Cable Television: 1970-1992," citing NCTA Research and the U.S. General Accounting Office.

[51] Harold L. Vogel, Entertainment Industry Economics, Second Edition, Cambridge: Cambridge University Press, 1990, p.156.

occurred, including relaxation of the ownership limits and treatment of distant signals.

To attribute these time trends solely to PTAR is to assume that these other events had no impact on the ratings of independent stations. Even the presence of the PTAR dummy is capturing the effects of some of these changes in this industry. To attribute the impact of these time trends to PTAR is ludicrous.

Over the 1995-2004 period, the quadratic time trend alone contributes 2.5-4.62 points to independent ratings.[52] For instance, in 1995, the elimination of the quadratic time trend changes the effect of PTAR's repeal from -2.8 to - 0.3 points for each time slot, i.e., reduces by nearly 90% the ratings reduction caused by the repeal of PTAR. We cannot calculate the contribution of the linear and cubic terms because their coefficients are not reported for either model, even though they are used to compute the cumulative PTAR effect.

Of course, these point estimates are not meaningful unless we include their confidence intervals, something that LECG does not produce. The width of the confidence interval for a forecast is, roughly speaking, proportional to the difference between a conditioning variable's mean and its value at the forecast.[53] It is impossible to compute this interval given the paucity of information supplied about the regression in the LECG report. Suffice it to note that the mean value of $T71^3$ in this sample is 1,768 whereas its value for prediction in 1995 would be 15,625, roughly 10 times its value, and hence a confidence interval 10 times as wide as the one around at the mean values of the explanatory variables.

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[52] We report this for the quadratic term because neither the linear or the cubic term are given for the model for all three half-hour periods, and none of the three time trend are given for the access period model.

[53] See, for example, William Greene, Econometric Analysis, Second Edition, New York: MacMillian, 1993, p. 165.

Furthermore, LECG derived its ratings reduction by taking the simple average over the top 30 markets. Because a station's rating reduction will be smaller if it resides in a larger market, weighting each rating reduction by the size of the market will greatly reduce the estimated effect from PTAR's repeal. Weighting the reductions by the number of TV households, we find that the reduction in ratings over the top 30 markets comes to -1.69 points, which is 28% less than the unweighted average of -2.34 points reported by LECG.

Taking the coefficient estimates from our model using unaveraged ratings, we calculate the point estimate and the confidence interval for the "cumulative PTAR effect" as the sum of the PTAR dummy and its interaction with Nind and PCI×TVHH (*i.e.*, we exclude the time trends). Evaluating the impact of the PTAR dummy plus one standard deviation increase in the other two variables, we find the cumulative PTAR effect to be 0.779 rating points. However, because all of these coefficients are so imprecisely estimated,[54] we cannot reject the hypothesis that the PTAR effect is different from zero at 95% confidence level.

A more subtle error that LECG commits has to do with how it computes the effect of PTAR's repeal. LECG claims to answer the question: what change would occur in independent station ratings during the period 1995-2004 if PTAR was repealed in 1995? In fact, LECG answers the question: what ratings would independent stations earn if there had never been a PTAR? LECG not only sets the PTAR dummy for all years to zero, it also sets the linear, quadratic and cubic time trends to zero as well.[55] Just as the latter variables accounted for the gradual phase in of PTAR, symmetry would dictate that they should allow for its gradual phase out as well. The time trends should be re-started at the time of repeal and allowed to operate in the reverse direction. Of course, a more sophisticated specification that took into

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[54] For instance the t-statistic on the PTAR dummy is a mere -0.089.

[55] See LECG, Appendix D, p.54, footnote 17.

account the intertemporal dependencies would capture the substantial inertia that these markets would experience with the removal of PTAR.

Finally, note the negative coefficient on the variable PTAR×PCI×TVHH for both the access period and for all three time slots.[56] This explains, in part, the fact that PTAR has a systematic differential effect on markets based on size. Notice, in particular, how repeal of PTAR actually increases independent station ratings in New York City.[57] Perhaps this conclusion would change if LECG properly adjusted per capita income for differences across market in the cost of living and the average sizes of households. On the other hand, this pattern may simply reveal that PTAR rewards independent stations differentially based on the size of the city in which they operate. The competition in large markets that have a greater number of independent stations limits the benefits of PTAR's protection. This is confirmed by a consistently negative coefficient on the variable measuring the number of independent stations.

D. The UHF Ratings "Handicap"

LECG claims that one role for PTAR is to help independent stations overcome the disadvantage caused by their use of UHF frequencies. Assuming without conceding that PTAR was intended to equalize the physical differences between VHF and UHF frequencies, we examined whether LECG's examination of a "UHF handicap."

We estimate a model that was approximately the "Fox specification" (as reported in

[56] See LECG, Table D.4.

[57] See LECG, Table IV.1 as well as Table D.7.

Appendix C) for affiliates as well as independents, and for various years, not just for 1993.[58] We used the full sample without any averaging across days of the week.[59] A dummy variable was included that took on the value of 1 if the station's channel was 14 or higher, and 0 otherwise. LECG chose to measure this UHF effect using only Fox stations claiming that too few UHF affiliates. Nevertheless, they have data that cover a 28-year span during which time there were many instances of UHF affiliates; in comparison, Fox provided few VHF data points in 1993.

Our regressions generated some interesting conclusions. First of all, a highly statistically significant UHF handicap emerged for network affiliates both in 1993 and for all years combined. Similar results held for independent stations as well. Over all years, there is roughly 10 rating point loss for affiliates compared to about 2.5 points for an independent.

Conclusions change when we introduce a variable measuring the "age" of the station, *i.e.*, the number of years that have passed since it first began operation. For network affiliates, this change has little effect on the UHF handicap. In the case of independent stations, however, the age variable cuts the handicap by more than half (down to 1.17 points). Furthermore, the station age variable is positive and highly significant (at 0.0935 points per year in operation). This says that an independent station is able to completely overcome the UHF handicap with 12.5 years of experience.

When we re-estimate the ratings equation on independents just for 1993, the UHF

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[58] The regression included TVHH, %CAB and Nind, where the latter was employed as a proxy to pick up the combined effects of the variables measuring the individual number of VHF and UHF stations. The regressions are run for each of the first two half-hours of prime time, but since the results are indistinguishable between the two time slots, we do not report the results separately.

[59] We were unable to run the regressions for specific days as LECG did in their report because the full Arbitron dataset did not indicate the day of the week.

handicap disappears; the UHF dummy is not statistically different from zero. Ignoring the imprecision of this estimate, based on the size of the station age coefficient, it now takes less than three years of experience to overcome the UHF handicap. The upshot is that the size of the handicap appears to have fallen over time, in part due to cable penetration, and the fact that stations have had plenty of time to gain the experience necessary to achieve high ratings.

Much of the past disadvantage of the UHF band was caused by the extensive entry that was occurring in these frequencies, especially in smaller markets. The downward trend in ratings was a combination of frequency disadvantages plus competition from other independent UHF stations.[60]

Finally, unlike LECG, we consistently produce a positive cable effect in these specifications for independent stations. Again, we are using a more disaggregated dataset that allows for variation across stations and days of the week. In any event, the cable penetration variable is capturing several effects, the two principal ones being the improved signal provided to UHF stations along with the increased competition from cable offerings. Proper treatment of the issue would require the researcher to separate the two effects. This could be done by having penetration picking up the "antenna effect," while a variable measuring the number of channels delivered by the system would pick up the "competition effect."

E. The Entry Equation

LECG believes that PTAR was responsible for entry of new independent stations. They attempt to demonstrate this hypothesis by estimating a relationship between the number of independent stations (Nind) and (contemporaneous) market conditions. Most of the explanatory

[60] In separate regressions we are able to establish that there is an additional penalty for stations in the high number channels (40 and above) in addition to the regular UHF handicap.

variables are familiar by now: per capita income of households (PCI), the number of television households in the market (TVHH), the percentage of households able to receive UHF signals (%UHF), and two of their time trend variables (T71 and $T71^2$). Linear and logistic regressions serve as the basis for their principal conclusions:

- Market size and wealth, along with the penetration of UHF equipment, contribute to entry by independent stations;
- Viewing the time trends as PTAR effects, the initial impact is negative but eventually turns positive after 15-18 years.

This exercise is marked by the complete lack of any economic modelling. In principle, entry is a disequilibrium phenomenon. Provided there is no legal or regulatory barrier, entry should occur when an entrepreneur perceives an expected, discounted profit. In that case, the appropriate dependent variable is the change in the number of independent stations. Instead, LECG models the current structure of the independent television industry. They make little effort to control for the role of expected profitability for independent stations. Nor do they distinguish between entry and exit, since they only observe the current number of independent stations.[61]

As with the earlier ratings equations, this entry model relies on time trends to capture PTAR's effects. (No PTAR dummy is included in the entry model.) And as before, these time trends serve as proxies for several monumental events that affect the evolution of the television industry in general, and independent broadcasting in particular.

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[61] In fact, failure to account for exit as well as entry causes an econometric problem. In several markets the current number of independent stations exceeds the number in 1993, and since the ratio of these two numbers is taken as the dependent variable for the logistic regression, it results in a value greater than 1 which is invalid for this econometric model. More generally, what LECG has are "count data" and these data demand special econometric techniques (e.g., a Poisson regression).

LECG recognizes the importance of the increases in cable penetration over these years for independent stations. But they do not include the variable %CAB as before because of difficulties in obtaining coefficient estimates. They claim that there is insufficient variation to estimate a coefficient for %CAB because of the many missing years in the 1980-90 time frame. Nevertheless there is still considerable variation across markets in the early 1980s, plus there is nonnegligible variation prior to 1980: cable penetration went from 3.8% to 27.3% over the period 1966-80.[62]

It is really no wonder that cable penetration is not estimable: the penetration rate of cable closely follows a time trend that increases geometrically, and coefficient estimates cannot be obtained when two or more explanatory variables move in unison.[63] Apparently the PTAR dummy did not have a significant effect so LECG called upon the time trends to control for this effect. These time trends capture much more than PTAR.

Perhaps the most glaring omission from LECG's entry equation is any account of the FCC's television station allocation plan. Much if not all of the growth in independent stations can simply be explained by the increasing allocation of UHF frequencies by the FCC over the 1966-93 time period. This increase was a product of the FCC's accelerated allocation of UHF frequencies: the number of licensed, on-the-air commercial UHF stations in the top 50 markets rose from 60 in 1975 to 269 in 1994, a jump of 348%.[64] Aside from a backlog of license applications and construction permits, the growth of independent stations tracked the expansion in the FCC's allocation of UHF slots. As a result, our interpretation of what LECG has

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[62] NCTA, "Growth of Cable Television," op. cit.

[63] In fact, the simple sample correlation between %CAB and $T71^2$ is nearly perfect in the estimation sample. In the full dataset we find a correlation of 0.72 for T71 and of 0.88 for $T71^2$.

[64] FCC, Use of Television Channels as of July 1, 1975, August 25, 1975; FCC, Television Channel Utilization Report, Table 1, December 31, 1994.

modelled is the process underlying the FCC's decision to allocate UHF frequencies. This is much more a political process than a market outcome.

F. EI's Measurement of Welfare Loss of the Network Restriction

In their report, Economists Incorporated (EI) attempts empirically to establish that barring the networks from programming the access period has had harmful effects on viewer welfare. EI begins by claiming that more people watch their televisions when networks program the access period. They base this claim in part on a so-called "Tuesday Effect." Following the initial PTAR decision, all three networks continued to program the access period on Tuesdays but not on other days of the week. EI finds a smaller reduction in TV usage on Tuesdays compared with other weeknight access periods during the 1971-72 season. On closer examination, we see that the "Tuesday Effect" is the product of aggressive programming; it does not represent a controlled experiment of the substitution of network for independent programming.

During the 1971-72 season, the first half hour of a one-hour program appeared on each of the three networks during the Tuesday access period. ABC, CBS, and NBC showed *Mod Squad*, *Glen Campbell Goodtime Hour* and *Ironside*, respectively, in the Tuesday 7:30-8:30 slot.[65] These were all successful shows.[66] By "straddling" 8:00 o'clock with popular

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[65] *Mod Squad* had appeared on this Tuesday 7:30-8:30 slot for three seasons previous to 1971-72; *Ironside* was moved from Thursdays at 8:30-9:30; *Glen Campbell* was moved from Sundays at 9:00-10:00.

[66] Previously, *Glen Campbell* ran for three years, *Mod Squad* for four (preceded by two seasons of *Felony Squad*), and *Ironside* ran for eight seasons under this title.

shows, the networks guaranteed high TV usage throughout the hour. In particular, loyal viewers of these three series were compelled to tune in during the Tuesday access period to follow their shows. Furthermore, one year is an extremely short time to give independent stations and independent producers to fill the access period with quality programming on other nights of the week.

Turning to TV usage during the access period on other weekdays, EI finds larger reductions on days of the week other than Tuesday, and concludes that substitution of independent programming for network fare caused about one-and-a-quarter million people to turn off their sets. To arrive at this number, EI implicitly assumes that all TV households are identical, and jumps to the conclusion that the lower percentage of TV usage results in reduced TV watching. In fact, despite the lower percentage of TV usage, it can be shown (using EI's data) that nearly a half a million additional households tuned in during the access period as a result of PTAR.[67]

The source of this discrepancy can be traced back to the definition for the percentage of households using televisions (%HUT); it is just the ratio of households using televisions (HUTs) to the number of television households (TVHHs). For instance, EI notes that the percentage of households using televisions during the half-hour access period, averaged over all weekdays except Tuesday, fell by 2.03% from 1969-70/1970-71 to 1972-73. And 2.03% of 62.1 million TVHHs in 1972 comes to 1.26 million fewer households operating their TVs during these times. This conclusion presumes that if all of the 62.1 million TVHHs were taken back to pre-PTAR years they would increase their TV usage by these percentages. In fact, TVHHs before and after PTAR are not the same. This is a period of rapid growth of TVHHs (about 3% per year),

[67] The average number of TVHHs in the combined 1969-70 and 1970-71 seasons was 59.3 million, while the average access period rating for these same seasons was 60.99%. This yields 36.17 million households using TVs. In the 1971-72 season, with 62.1 million TVHHs with rating of 58.96%, results in 36.61 million HUTs. See Table I-1 in Appendix I of EI's report.

and incremental TVHHs will have lower viewing intensities. A delayed TV purchase reveals less interest in TV viewing than earlier purchases, a typical pattern of late adopters of a new technology. Furthermore, these newcomers will necessarily have fewer TVs per household on average than the general population.

EI's last attempt to establish the welfare loss to the network restriction is based on a 22 year old study of the value of broadcast signals calibrated from cable subscription behavior.[68] The computation is welfare loss from the replacement of network programming with independent programming seriously overstates the case.[69]

The starting point for this exercise is a regression that estimates a model of viewer valuation of program offerings on cable television.[70] Coefficients on the number of network and independent stations provide the basis for comparing the relative value of these two types of signals. The estimations were performed on subscription behavior for 31 cable systems in 1969.

First of all, this sample is not representative of the 2,490 cable systems in 1969, and subscription choice back then is in no way indicative of subscription behavior in 1995. Below we will see how the small sample reduces confidence in the point estimates. Second, the precision of the estimates aside, the true coefficients will have changed drastically in 25 years. In 1969 cable merely retransmitted over-the-air signals whereas now the vast majority of

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[68] Noll, Peck and McGowan, Economic Aspects of Television Regulation, Brookings Institution, 1973.

[69] For reference sake, here is how EI computed the $2.5 billion (in 1971 dollars) consumer welfare loss from PTAR: $2.495 billion = (3.7% of income) x ($4,302/person) x (3.1 persons/HH) x (2.1 million HHs) x (14.3% of Prime Time) x (57% share of audience).

[70] See Noll, Peck and McGowan, Appendix A, especially Tables A-1 and A-2.

channels are cable networks. Furthermore, viewing habits have changed considerably with the introduction of VCRs. Reestimation of the Noll, et.al. specification will surely result in much smaller values attached to over-the-air programs measured in terms of the percentage of household income.

The key coefficients themselves are not very precisely estimated. For instance, the coefficient on the number of affiliate channels and independent channels have 95% confidence intervals around them that overlap. In other words, to be 95% confident of the true value of these parameters,[71] we cannot be certain that the two parameters are not equal (or possibly that the coefficient on affiliate stations is actually lower than that for independent stations).

This fact shows up in the welfare calculations, which is the basis for EI's astonishing $200 billion figure. The basis for that calculation is the fact that three affiliate stations are valued at 5.07% of household income whereas three independent signals are valued at 1.34%. The 95% confidence interval on the first estimate runs from 2.61% to 7.41%, while for the second it is 0.16% to 2.80%. Because the two intervals overlap, we cannot conclude with a high level of confidence that viewer welfare is greater for affiliates than for independent stations.[72] In other words, the reduction in viewer welfare equal to 3.73% of average household income used by EI is not statistically different from 0%.[73]

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[71] To calculate this interval we make the assumption that the normalized regression coefficients have a t-distribution with 24 degrees of freedom.

[72] To perform a test that the coefficients are different, the sample covariance between the two variables (number of affiliate and independent stations) is needed. This statistic is not reported in Noll, et. al. (1973), however. But since we can safely assume that there were three affiliate stations in each market, the covariance is zero, and as a result, the conclusion that the two welfare estimates are not statistically different based on the overlap in confidence intervals is correct.

[73] Furthermore, EI made several assumptions when it applied the independent station differential proportionately to the half-hour access period. The Noll, et. al. (1973) estimates measured the value of a signal available throughout the broadcast day, 365 days of the year. In this sense, they measured the "option value" of these stations to households. When EI simply scaled the differential according to the fraction of prime time accounted for by the access period half hour, they were implicitly measuring only the "use value" to households of the half-hour broadcast, not the value of continuous access to a program stream.

IV. CONCLUSION

Complex issues of economic organization–such as television programming and broadcasting–often benefit by being joined from several different perspectives. In this instance, however, we came out where we came in: the comparative institutional approach for examining the efficiency consequences is the one that the FCC should apply.

On our reading, the lens applied by LECG is opaque and distorts the issues. Fundamentally, theirs is a redistributional exercise masquerading as efficiency analysis. The EI and FTC Staff lenses are better in this respect, but they are too narrow to address the diversity issue in a productive way. Furthermore, the empirical analysis offered by LECG and EI fails to persuade us that their positions on the off-network and network restrictions are supported by the evidence. Accordingly, our recommendation is that the Commission repeal the off-network restriction immediately, but retain the network restriction until changes in market conditions warrant its repeal as well.